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It is known that there are gender differences in one-carbon metabolism (OCM). Women in the child-bearing years exhibit lower plasma homocysteine, higher betaine and choline, and lower S-adenosylmethionine. Various enzymes in OCM are up-regulated or down-regulated in women due to estrogen. Insulin and glucose affect some enzymes of OCM and change furthermore during pregnancy. All of these results suggest that a mechanistic understanding of how enzymatic differences in women affect OCM is important for precision medicine.

The reaction diagram for the folate and methionine cycles in OCM is very complicated consisting of loops within loops. Furthermore, many substrates in the network influence, through allosteric binding, the activity level of enzymes at distant locations in the network. A mathematical model of folate and methionine metabolism is used to study the enzymatic changes in women of child-bearing age and the resulting concentrations of metabolites. In each case the results are compared to clinical and experimental studies. The causal mechanisms by which the gene expression or enzyme activity changes in women that lead to the metabolite changes will be discussed. (Received September 26, 2017)